13 #3

The MONTHLY REVIEW

Published Monthly by the

American Electroplaters Society

A SOCIETY FOR THE ADVANCEMENT

OF THE

SCIENCE OF ELECTROPLATING

MARCH, 1926

Entered as second-class matter, September 26, 1922, at the Post Office at Oneida, N. Y., under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage, provided for in section 1103, Act of October 3, 1917, authorized September 26, 1922.

KRESGE-HOOKER
WAYNE
UNIVERSITY

EXECUTIVE BOARD, A. E. S., 1925-1926

President
E. J. Musick, 7144 Kingsbury Blvd., St. Louis, Mo.

First Vice-President
George Gehling, 5001 Edmund St., Philadelphia, Pa.

Second Vice-President
John H. Feeley, 411 Aylmer St., Montreal, Quebec

Secretary-Treasurer
R. Steuernagel, 1508 Concordia Ave., Milwaukee, Wis.

Past President
Frank J. Hanlon, 216 N. Jefferson St., Chicago, Ill.

Editor
F. C. Mesle, 166 Willow Place, Sherrill, N. Y.

Associate Editors
Dr. Wm. Blum, Bureau of Standards, Washington, D. C.
B. F. Lewis. 10398 American Ave., Detroit, Mich.

MEMBERSHIP DRIVE

Fellow Members:

Allow me to urge you to complete the membership drive.

Most of the branches have shown the results that were expected of them and the members themselves know whether their branch is one of the progressive branches or not.

Won't you please get those non-members in your district who are eligible to join at once?

E. J. MUSICK,
Supreme President.

MONTHLY REVIEW

Published by the

American Electroplaters' Society

ONEIDA, NEW YORK

Editor's Office, 166 Willow Place, Sherrill, New York

VOL. XIII MARCH, 1926 No. 3

EDITORIAL

THE A. E. S. RESEARCH FUND

The prestige of the A. E. S. is at stake. Your research committee have mailed two letters to over 1,600 manufacturers in the United States and Canada stating that we are going to raise a Research Fund and asking for their subscriptions.

Most of these letters have been read, but laid aside, as usual. Most of the manufacturers who have read these letters will listen to a verbal explanation made by you or a committee of A. E. S. members. Most of the manufacturers who have been thus approached will gladly subscribe to the Research Fund.

Now, then, I urge you and your branch to respond to the appeals of your Research Committee? They have undertaken a big job which will easily be successful with your assistance and made much harder and perhaps unsuccessful by your lack of interest.

We cannot afford to fail in raising this research fund. The prestige of our Society is at stake.

DO YOU CARE?

E. J. MUSICK,

Supreme President.

APPROVED METHODS OF ANALYZING PLATING SOLUTIONS

By O. J. Sizelove, Newark Branch

Introductory

In the past few years, chemistry has played a very great part in the successful electro deposition of metals. The plater, who has been able to control his solution by analysis, has had an advantage over his less fortunate associates.

The time has come, when the plater of the future, must be able to control his solution by analysis or give way to one who can. The assistant platers of today are studying chemistry, and in the course of a few years, will be able to do what the majority of the platers cannot do, unless he will devote some of his spare time to the study of chemistry. Realizing their needs, following will be found the analysis of the different solutions, and any one with a little practice can become enough of a chemist to be able to maintain his solution by chemical control.

The methods given have been taken form various text books on chemistry, and have been simplified as much as possible, so that the plater can get what he requires without being compelled to study for years, as was necessary for the writer to do.

If there is any further information desired by any member of the Society, it will be given most cheerfully, and if the analysis of the different solutions will be the means of helping my associates, will consider myself fully repair indeed.

Nickel Solution

For the analysis of this solution, what is known as Moore's method, is used, and it is based on the fact that if to an ammoniacal solution of nickel containing silver iodide in suspension (silver iodide being almost insoluable in weak ammonia) there is added sodium cyanide, the solution will remain turbid so long as all the nickel is not converted into the double cyanide of nickel and sodium, the slightest excess of cyanide being indicated by the clearing of the liquid,

and furthermore, this excess may be exactly determined by adding a solution of silver nitrate until the turbidity is reproduced.

Standard Solution

Silver Nitrate N/10 Ag NO_3 solution

Weigh 17 gms. of silver nitrate c. p. and dissolve in a small amount of distilled water and then transfer to a litre flask and dilute accurately to 1,000 cc.

The silver nitrate should be the C.P. salt and if care is used in making the standard solution it will be ready for use. It can, however, be checked against a solution made from pure silver foil.

Sodium Cyanide N/10 Na CN solution

Weigh 9.8 gms. sodium cyanide, dissolve in water, transfer to litre flask and dilute to exactly 1000 cc.

Dissolve .1 gm. of pure nickel foil in 5 cc with water and add 10 cc of NH_4OH and then dilute to 150 cc with water. Add .2 cc of a 10% KI solution.

Note: Two separate burettes should be used, one to contain the Na CN solution, the other the N/10 Ag NO_3 solution. Add sufficient N/10 Ag NO_3 until a permanent cloudiness is obtained. Titrate with Na CN until the solution is clear. Add N/10 Ag NO_3 again until a faint cloud appears. This is to check against an excess of Na CN. Titrate again to clearness with Na CN being careful not to go beyond end point.

Calculation for Factor

Subtract from the number of cc of Na CN the product obtained by multiplying the number of cc of N/10 Ag NO_3 used by its factor (see standardization of N/10 Ag NO_3 solution). The number of cc of Na CN found divided into the weight of the nickel=the factor for the Na CN solution.

Example: .1 gm. of nickel required 1.9 cc of N/10 Ag NO_3 and 37.6 cc Na CN

1 cc N/10 Ag=1.04 cc of Na CN (see note)

1.9x1.04=1.976=Corrected N/10 Ag NO_3

37.6—1.976=35.624=cc of Na CN actually used for the nickel solution.

.1÷35.624=.0028.

∴ 1 cc of N/10 Na CN solution=.0028 gms. of nickel.

Note: 1.04 was obtained by standardizing the Na CN solution against N/Ag NO_3 solution.

Take 10 cc of Na CN solution and dilute to 50 cc with water, add .2 cc of 10% KI and titrate with N/10 Ag NO_3 until a faint cloudiness persists.

Example: 9.6 cc of N/10 Ag NO_3 used.
10÷9.6=1.04.
∴ 1 cc of N/10 Ag NO_3=1.04 cc N/10 Na CN.

Analysis of Nickel Solutions

Nickel Content

Take 5 cc of solution, dilute to 50 cc with water, add a small crystal of tartaric acid ($H_2C_4H_2C_2$) to hold the iron in solution. Add 5 cc of NH_4OH and dilute to 200 cc with water. For an indicator add a few drops of a 10% solution of KI. Titrate with the standard Na CN solution, using the same method as used for standardizing Na CN against nickel.

Example: If the 5 cc of nickel solution required 47.2 cc of the Na CN solution and .5 cc of the N/10 Ag NO_3 solution the following calculations should be made:

1.04=factor for the standard N/10 Ag NO_3 solution
.50=cc of N/10 Ag NO_3 used

.520=corrected number of cc used
47.20=cc of Na CN used
.52=cc of N/10 Ag NO_3

46.68=cc of Na CN, corrected amount
.0028=factor for Na CN solution

37344
9336

.130704=gms. of nickel in 5 cc sample taken
.130704x26.6=3.47 oz. of nickel per gallon of solution.

Chlorine Content

Take 1 cc of nickel solution, dilute to 50 cc with water in a 150 cc beaker. Add 1 cc of 10% potassium chromate

solution (K_2CrO_4) as an indicator. Titrate with N/10 Ag NO_3 until solution acquires a red buff color.

Calculation: 1 cc N/10 Ag NO_3=0.003546 gms. Cl
1 cc N/10 Ag NO_3=0.00535 gms. NH_4Cl
1 cc N/10 Ag NO_3=0.00585 gms. Na Cl

Chlorine calculated as NH Cl

Number of cc N/10 Ag NO_3x.71=oz of NH_4 Cl per gal. of nickel solution.

Number of cc of N/10 Ag NO_3 used x 0.003546=gms. of Cl

Grams of Cl per cc x 1.509x133.5=oz. NH_4 Cl per gal. of nickel solution

1.509 is obtained by dividing .00535 by .003546

.71 represents the result of .003546x1.509x133.5

Chlorine calculated as Na Cl

Number of cc of N/10 Ag NO_3 used X .78=oz. of Na Cl. per gal.

.78 represents the result of .003546x1.649x133.5

1.649 is obtained by dividing .00585 by .003546

Sulphuric Acid N/10 H_2SO_4

Take 3 cc of H_2SO_4 C.P. Sp.g. 1.840 and in a litre flask dilute to 1000 cc.

Sodium Carbonate Na_2CO_3 C.P. Anhydrous

The best method of preparing sodium carbonate for standardizing sulphuric acid is to half fill a platinum basin with pure sodium bicarbonate in powder ($NaHCO_3$). Place it in an air bath already heated to about 200° C., and raise the temperature to 270-80°, but not more than 300° C. Let it remain at this temperature for half an hour, then cool it in an exsiccator, and before it is quite cold transfer it to a warm, dry, stoppered tube or bottle, out of which, when cold, it may be weighed rapidly as wanted. The carbonate so produced will be from lumps and easily soluble in cold, distilled water.

Standardizing Sulphuric Acid

Weigh out 0.053 gms. Na_2CO_3 and dissolve in 50 cc of water. Add 2 or 3 drops of methyl orange and titrate with the H_2SO_4 until a pink end point remains. If the H_2SO_4 was exactly an N/10 solution then exactly 10 cc of the H_2SO_4 would have been used.

Example: 9.8 cc of $H_2 SO_4$ used

10 cc—9.8 cc=0.2

∴ This $H_2 SO_4$ solution requires the addition of 0.2 cc of water for each 10 cc of solution.

To correct the litre of solution

1000 cc—9.8 cc used=990.2

9.8:990.2::0.2:X

X=20.2

∴ 20.2 cc of water should be added to the $H_2 SO_4$ solution to make it exactly an N/10 solution.

Determination of the Alkalinity of Nickel Solutions Calculated as cc of Ammonia Sp. G. 0.90 per Gallon

Take 10 cc of nickel solution, dilute to 100 cc with water, add 4 or 5 drops of indicator (methyl red), and titrate with N/10 $H_2 SO_4$. A light red color denotes the end point.

Calculation:

The number of cc of N/10 $H_2 SO_4$x2.52=cc of NH_4OH per gal. when 10 cc of nickel solution is taken.

This calculation is based upon NH_4OH Sp. G. 0.90=28% NH_3 1 cc N/10 $H_2 SO_4$=0.0017 gms. NH_3

NH_4OH contains 28% of NH_3

1 cc NH_4OH contains 0.0017÷28x100=0.00607 gms. NH_3

NH_4OH c .p. has a Sp. g. of 0.90

1 gm. NH_4OH=0.00607÷90=6.0067 cc NH_4OH—or,

0.0067x378=2.52 cc NH_4OH when 10 cc of nickel solution are taken.

This method is based on the fact that all good working nickel solutions are on the alkaline side to methyl red. If when testing a solution it is found to be on the acid side a convenient method is to add NH_4OH to the plating solution in small quantities until an alkaline reaction is obtained and then titrate for the actual alkalinity. If found to alkaline H_2SO_4 should be added. One cc of C.P. of H_3SO_4 reduces the alkalinity of the solution 2.5 cc NH_4OH per gallon.

Symbols

$Ag\ NO_3$=Silver Nitrate
$H_2C_4H_2\ C_2$=Tartaric Acid
Na CN=Sodium Cyanide
KI=Potassium Iodide
$K_2Cr\ O_4$=Potassium Chromate
Cl=Chlorine
Na Cl=Sodium Chloride
NH_4Cl=Ammonium Chloride
NH_3=Ammonia Gas
NH_4OH=Ammonium Hydroxide
Na OH=Sodium Hydroxide
H_2SO_4=Sulphuric Acid
Na_2CO_3=Sodium Carbonate
$Na\ HCO_3$=Sodium Bi-Carbonate

Indicators

Methyl Orange

Dissolve 0.02 gms. in 100 cc of water

Potassium Iodide KI 10% solution

Dissolve 10 gms. of the C.P. salt in 100 cc of water

Potassium Chromate $K_2\ CO_4$ 10% solution

Dissolve 10 gms. of the C.P. salt in 100 cc of water

Methyl Red

Dissolve 1 gm. in a small amount of methyl alcohol and dilute to 100 cc.

Methods of Analysis of Cyanide Copper, Cyanide Zinc and Brass Plating Solutions

Standard Solution $N/10\ Na_2S_2O_3$

Weigh out 24.822 gms. of c.p. $Na_2S_2O_3$, dissolve in water and dilute to exactly one litre in a glass stoppered litre flask.

Standardize this solution against pure copper wire.

Method:

1. Dissolve 0.2 gms. copper wire with 5 cc. of c.p. HNO_3 in a 400 cc beaker.
2. Boil to drive off all NO_2 fumes.
3. Neutralize with NH_4OH and boil.
4. Add 10 cc of $C_2H_3O_2$ and boil.
5. Allow to cool and dilute to 250 cc with water.

6. Add 3 to 4 gms. KI.
7. Titrate with N/10 $Na_2S_2O_3$ solution using starch as an indicator. End point=cream color.

Calculation:

0.2 gms. divided by number of cc of $Na_2S_2O_3$ used=factor for standard $Na_2S_2O_3$ solution.

Example:

31.5 cc $Na_2S_2O_3$ used

0.2÷31.5=0.00635 gms. of copper

∴ Each cc of $Na_2S_2O_3$=0.00635 gms. of copper.

Metal Content of Cyanide Copper Solution

1. Take 10 cc cyanide copper solution.
2. Diluate to 100 cc with water.
3. Add 1 or more cc of concentrated solution of sodium sulphide Na_2S.
4. Make slightly acid with dilute HCL (1:1). The solution should not be made any stronger than N/2 with HCL.
5. Filter and wash precipitate thoroughly with hot water.
6. Transfer filter paper and precipitate to a 400 cc beaker.
7. Add 5 cc of HNO_3 and heat gently until NO_2 fumes are expelled and let cool.
8. Neutralize with NH_4OH and boil.
9. Add 8 to 10 cc of $C_2H_3O_2$ and boil.
10. Allow to cool and dilute to 250 cc with water.
11. Add 3 to 4 grams KI.
12. Titrate with standard $Na_2S_2O_3$ solution using starch as an indicator. End point=cleam color.

Calculation:

Number of cc used x factor x 13.3=oz. of copper per gallon.

Standard N/10 Ag NO_3

1. Weigh accurately 17 gms. c.p. Ag NO_3 crystals.
2. Dissolve in distilled water and dilute to exactly one litre in a glass stoppered litre flask.
3. Weigh approximately 0.5 gms. Na CN in weighing bottle.
4. Dissolve in distilled water and dilute to 100 cc.

5. Add 0.2 cc of 10% KI solution.
6. Titrate with N/10 Ag NO_3 until faint turbidity appears.

Calculation:

The number of cc used divided into 0.5 gms. Na CN= factor.

Example:

.498 gms. Na CN taken.
47.3 cc of N/10 Ag NO_3 used.
0.498÷47.3=0.0105.
∴ Each cc of N/10 Ag NO_3=0.0105 gms. Na CN.

Free Cyanide Content of Copper Solution

1. Take 10 cc copper cyanide solution.
2. Dilute to 100 cc with distilled water.
3. Add a few drops of N/10 KI solution.
4. Titrate with N/10 Ag NO_3. End point=fain turbidity.

Calculation:

Number of cc of Ag NO_3 used x factor x 13.3=oz. of free sodium cyanide per gallon, or each cc of Ag NO_3 used=0.005208 gms. of CN per gallon.

Zinc Cyanide Solution

Standard Solution N/10$K_4Fe\ CN_6$

Weigh out 21.63 gms. $K_4Fe\ CN_6$ and 7 gms. Na_2SO_3. Dissolve in distilled water and dilute to exactly one litre.

1. Weigh out 0.3 gms. of pure metallic zinc.
2. Dissolve in 10 cc of CHl (1:1) in a 250 cc beaker.
3. Dilute to 150 cc with water and heat to 140° F.
4. Add 1 cc of $Uo_2(NO_3)_2$.

Note:

$Uo_2(NO_3)_2$ solution made by dissolving 5.2 gms.
$Uo_2(NO_3)_2$ in 100 cc of water.

5. Titrate with $K_4Fe\ CN_6$ using $No_2(NO_3)_2$ as an outside indicator. End point=faint brown color.

Calculation:

60 cc K_4FeCN_6 used.
0.3÷60=.005.
∴ Each cc of Standard K_4FeCN_6=.005 gms. of zinc.

Metal Content Cyanide Zinc Solution

1. Take 10 cc zinc cyanide solution.
2. Dilute to 50 cc with water.
3. Heat to 140° F.
4. Add saturated solution of c. p. crystallized Na_2S
5. Digest and filter.
6. Wash twice with warm water to which a few drops of the saturated Na_2S solution has been added.
7. Transfer precipitate and filter paper to 250 cc beaker.
8. Add 10 cc c.p. concentrated HCl and a few Na_2SO_3 crystals.
9. Boil to expel H_2S.
10. Dilute to 150 cc and heat to 140° F.
11. Add 1 cc Uranium nitrate $Uo_2 (NO_3)_2$.
12. Titrate with standard $K_4Fe\ CN_6$ using $Uo_2(NO_3)_2$ as an outside indicator. End point=faint brown color.

Calculation:

Number of cc of $K_4Fe\ CN_6$ used x the factor x 13.3=oz. of zinc per gallon.

Example:

18 cc of $K_4Fe\ CN_6$ used.

18x.005x13.3=oz. of zinc per gallon.

Free Cyanide Content

The usual method of determining the free cyanide in cyanide zinc and brass solutions with N/10 Ag NO_3 is inaccurate when Na OH is used in the plating solutions.

By using Cu $(NO_3)_2$ in place of Ag NO_3 the result, while it may not be as accurate as desired, is far the best that can be given at present, for the Na OH does not interfere with the titration.

Standard Solution N/10 Cu $(NO_3)_2$

1. Weigh 24.16 gms. c.p Cu $(NO_3)_2$
2. Dissolve in water and dilute to exactly 1 liter.
3. Weigh approximately .5 gm. Na CN in weighing bottle.
4. Dissolve in water and dilute to 100 cc.
5. Add 10 cc c.p. NH_4OH.
6. Titrate with N/10 Cu $(NO_3)_2$ until a faint purple color remains after standing for a minute.

Calculations:

The number of cc Cu $(NO_3)_2$ used divided into the weight of the Na CN taken=factor.

Example:

.496 gms. Na CN taken.
26.6 cc Cu $(NO_3)_2$ used.
.496÷26.6=.0186.
∴ Each cc N/10 Cu $(NO_3)_2$=.0186 gms. Na CN.

Free Cyanide Content of Zinc Solution

1. Take 10 cc zinc solution.
2. Dilute to 100 cc.
3. Add 10 cc c.p NH_4OH.
4. Titrate with N/10 Cu $(NO_3)_2$. End point light purple color.

Calculations:

Number cc Cu $(NO_3)_2$ use x factor x 13.3=oz free sodium cyanide per gallon.

Metal Content of Brass Solution

1. Take 10 cc of solution.
2. Dilute to 50 cc and heat to 140° F.
3. Add while constantly stirring a saturated solution of c.p. Na_2S. Zinc will be precipitated, the copper will be left in solution.
4. Filter zinc sulphide precipitate and wash twice with warm water to which a few drops of the saturated Na_2S solution has been added.
5. Save filtrate for copper determination.
6. For zinc determination follow method given under "Cyanide Zinc Solution." Start with operation No. 7.
7. For copper determination follow method given under "Cyanide Copper Solution." Start with operation No. 4.

Free Cyanide Content of Brass Solution

Same as for determing free cyanide in cyanide zinc solution.

Symbols

Na_2S=Mono Sodium Sulphide C.P.
NH_4OH=Ammonium Hydroxide
$C_2H_3O_2$=Acetic Acid
KI=Potassium Iodide

$Na_2S_2O_3$=Sodium Hyposulphite
$Uo_2(NO_3)_2$=Uranium Nitrate
$K_4Fe\ CN_6$=Potassium Ferrocyanide
Na_2SO_3=Sodium Sulphite
$Ag\ NO_3$=Silver Nitrate
Na CN=Sodium Cyanide
H Cl=Hydrochloric acid
$H\ NO_3$=Nitric Acid

Acid Copper

Standard Solutions and Indicators

Sodium thiosulphate ($Na_2S_2O_35H_2O$), 24.822 grams per liter.

Oxalic acid ($C_2H_2O_4\ 2H_2O$), 2 grams.

Starch solution, 1 gm. to 100 cc H_2O.

Methyl Orange .01 grams per 100 cc H_2O.

Phenolphthalein ($C_{20}H_{14}O$) 1 gram to 100 cc neutral alcohol.

For the metal content, what is known as the iodide method is used, which consists of converting the copper into cuprous iodide (Cu_2I_2) and titrating with a solution of sodium thiosulphate, using a starch solution as an indicator.

The end point is so exact that with a little practice it can be determined to within one drop of the sodium thiosulphate solution.

Standardizing Sodium Thiosulphate ($NA_2S_2O_3$)

Weigh out exactly .2 gm. pure copper wire, dissolve in 5 cc C.P. $H\ NO_3$, boil to expel NO_2 gas. Let cool, dilute with 25 cc H_2O, and neutralize with ammonium hydroxide (NH_4OH), boil and add 10 cc acetic acid ($C_2H_3O_2$). Let cool, dilute to 150 cc with H_2O and add 3 gms. potassium iodide (K I). This causes the solution to turn brown and the copper has been converted to cuprous iodide (Cu_2I_2). Titrate with the sodium thiosulphate solution until the brown color becomes quite light. Now add 1 cc of starch solution, this causes the solution to turn to a blue color. Continue titration with the sodium thiosulphate solution with constant stirring until the color changes to a cream

color. Let stand for a few minutes and if solution does not change to blue color the end point has been reached.

Calculations

Say that 31.5 cc sodium thiosulphate has been used, 2 divided by 31.5=.00635. Therefore, 1 cc sodium thiosulphate is equal to .00635 grams copper.

For Metal Content of Plating Solution

Take 5 cc of the acid copper plating solution, add 25 cc H_2O and neutralize with NH_4OH. Boil and add 10 cc acetic acid. Dilute to 150 cc with H_2O, let cool, add 3 grams K I, and titrate with $Na_2S_2O_3$ using starch as an indicator.

Example:

41 cc $Na_2S_2O_3$ are used.

1 cc $Na_2S_2O_3$=.00635 grams copper.

41x.00635x26.6=6.92. Therefore, each gallon of solution contains 6.92 oz. copper.

Standardizing Caustic Soda (NA OH)

Take 2 grams oxalic acid, dissolve in water and dilute to 100 cc, add a few drops of phenolphthalein and titrate with the caustic soda until a light red color persists.

Say that 64 cc are used and the following reaction takes place:

$H_2C_2O_4.2H_2O+2Na\ OH=Na_2\ C_2O_4+4H_2O$

Mol. wt. $H_2C_2O_4.2H_2O$=126

Mol. wt. 2 Na OH=80

Therefore, 126:80::2:x

x=1.27

Or we find that 1.27 grams caustic soda react or neutralizes 2 grams oxalic acid. If there was 1.27 grams caustic soda in 64 cc, 1 cc would equal 1.27÷64 or .0198 grams Na OH.

$2\ Na\ OH+H_2SO_4=Na_2S\ O_4+4H_2O$

Mol. wt. 2 Na OH=80

Mol. wt. $H_2S\ O_4$=98

or 80 parts Na OH react with 98 parts $H_2S\ O_4$.

Therefore, 80:98::.0198:x

x=.0242

Each cc Na OH equals .0242 grams H_2SO_4.

For Acid Content of Plating Solution

Take 10 cc of the plating solution, dilute to 100 cc with

H_2O, add a few drops of Methyl orange and titrate with the caustic soda solution to a slight yellow color.

Example:

30.5 cc Na OH used.

1 cc Na OH=.0242 grams H_2SO_4

30.5x.0242x13.3=9.816 ozs. avd. H_2SO_4 per gallon of solution.

9.816÷1.84=5.33 fluid oz. H_2SO_4 per gallon.

Acid Zinc Solution

Metal Content

Take 5 cc solution in 250 cc beaker, dilute to 25 cc and neutralize with Na_2CO_3. Add 10 cc c.p. H Cl and further dilute to 150 cc. Heat to 140° F., add 1 cc Uo_2 $(NO_3)_2$ and titrate with K_4Fe CN_6, using Ur $(NO_3)_2$ as an outside indicator.

Calculations

Number of cc K_4Fe CN_6 used x factor x 26.6=oz. of zinc per gallon solution.

Acid Content

Take 10 cc of the solution in 150 cc beaker, dilute to 100 cc. Add 2 or 3 drops methyl orange and titrate with N/10 Na OH. End point light yellow color.

Calculations . .

Number cc Na OH used x factor x 13.3=oz. avd. H_2SO_4 per gallon.

Os. H_2SO_4÷1.84=fluid oz. H_2SO_4 per gallon.

Note: K_4 $FeCN_6$ standardized for factor same as for zinc cyanide solution.

N/10 Na OH standardized for factor same as acid copper solution.

Black Nickel

The metal and acid content are determined the same way as given under the analysis of nickel solution.

Zinc Content

Take 10 cc of the black nickel solution in a 250 cc beaker, dilute to 25 cc and add enough sodium cyanide to convert the nickel and the zinc into a double cyanide of nickel and zinc solution. Heat to 140° F. and add saturated solution of sodium sulphide (Na_2S). Digest, filter and follow with operation No. 6 under zinc cyanide solution.

Ammonium Sulphocyanate Content

Take 10 cc of plating solution, dilute to 100 cc. Make slightly acid with H_2SO_4. Add 10 drops of a 10% solution, iron ammonium sulphate, $Fe(NH_4)_2 (SO_4)_2$ and titrate with N/10 $AgNO_3$ until red color of solution disappears.

Calculations

Number of cc N/10 Ag NO_3 used x factor x 13.3=oz. NH_4 CNS per gallon.

Standardizing

Ag NO_3 for ammonium sulphocyanate (NH_4 CNS) content.

Weigh approximately .3 gm. of ammonium sulphocyanate, dissolve in water and dilute to 100 cc. Make slightly acid with H_2SO_4, add 10 drops of a 10% solution of iron ammonium sulphate and titrate with N/10 Ag NO_3 until red color of solution disappears.

Example:

.267 gms. NH_4CNS taken
34.5 cc Ag NO_3 used
.267÷34.5=.00744
∴ each cc N/10 Ag NO_3=.00744 gms. NH_4CNS

Silver Solution

Standardizing NH CNS—Ammonium Sulpho-Cyanide

Take 22 gms. NH_4CNS, dissolved in water and make to 1 Liter. Weigh .5 gms. pure silver, place in 250 cc beaker, dissolve with 5 cc, C.P. HNO_3, and a few drops of water. Dilute to 200 cc and add a few drops of a 10% solution (NH_4) Fe $(SO_4)_2$ (Iron-ammonium sulphate) and titrate with NH_4CNS until a faint red color appears.

Calculations

Number of cc NH_4CNS used divided into .5=factor for NH_4CNS.

Example:

16.1 cc NH_4CNS used.
.5÷16.1=.031. Therefore each cc of Standard NH_4CNS =.031 gms. silver.

Metal Content

Take 10 cc of silver plating solution, dilute to 50 cc with water. Heat gently and add enough ammonium sulphide to precipitate the silver. Digest, filter and wash.

Place the filter paper containing the p.p. in a 250 cc

beaker, add 5 cc HNO_3 and boil to expel NO_2 fumes. Dilute to 200 cc, add a few drops (NH_4) Fe $(SO_4)_2$ and titrate with NH_4CNS until a faint red color appears. The number of cc of NH_4CNS used x factor x 12.2=oz. Silver (Troy) per gallon solution.

Example:

9 cc NH_4CNS used.

9x.031x12.2=3.40 oz. (Troy) silver per gallon.

Determining Free Cyanide

Take 10 cc plating solution, place in 150 cc beaker, dilute to 100 cc with water, add a few drops of 10% solution K.I. and titrate with N/10 $AGNO_3$ until faint cloud appears.

The number of cc used x factor for $AgNO_3$x13.3=oz. free cyanide per gallon of solution.

Example:

26 cc $AgNO_3$ used.

26x.0105x13.3=3.63 oz. free cyanide per gallon.

Gold Solution

N/100 Iodine 1.27 gms. Iodine, 2.5 gms. KI to 1 Liter.

N/100 $Na_2S_2O_3$, 2.48 gms. to 1 liter.

Standardizing

Weigh accurately .1 gm. fine gold and dissolve in a 250 cc beaker with aqua regia, evaporate to dryness, dilute to 150 cc and add enough 10% solution KI until the gold precipitated as aurous iodide is completely dissolved. Starch solution is then added, and the amount of N/100 $Na_2S_2O_3$ required to decolorize the liquid noted. From this amount is deducted the amount of N/100 iodine required to just produce a perceptible rose tint in the liquid.

Calculations

Subtract the number cc of iodine used from the number of cc $Na_2S_2O_3$ used, and divide the weight of the gold taken by the remainder.

Example:

106.1 cc of $Na_2S_2O_3$ used.

3 cc of iodine used.

106.1—3=103.1 corrected amount of $Na_2S_2O_3$

.1÷103.1=.00097

.:. each cc of N/100 $Na_2S_2O_3$=.00097 gms. gold

Metal Content of Cyanide Gold Solution

Take 10 cc of the solution in a 250 cc beaker, add enough HCL to destroy the cyanide and convert the gold to a tri-chloride of gold solution. Evaporate to dryness, dilute to 150 cc, add an excess of 10% KI solution, and a few drops of starch solution which produces a dirty green color.

Titrate with N/100 $Na_2S_2O_3$ until the solution is decolorized and then titrate back with the N/100 iodine solution until rose tint appears.

Calculations

Number of cc $Na_2S_2O_3$ used minus the number of cc iodine used x factor x 12.2=oz. of gold (Troy) per gallon oz. of goldx20=pwt. per gallons.

Free Cyanide Content

Take 10 cc of solution, dilute to 100 cc, add a few drops of a 10%solution KI, and titrate with N/10 $AgNO_3$ until a faint cloudiness appears.

Calculations

Number of cc of Ag NO_3 used, x factor for Ag NO_3x13.3 equals oz. of free Na CN per gallon solution.

Metal Content

Salt Water Gold and Yellow Prussiate Immersion Gold Solutions.

Take 10 cc of solution, add 10 cc c.p. HCL to destroy the cyanide and evaporate. Dilute to 150 cc, add 10 cc of a 10% solution ferous sulphate (Fe_2SO_4. 7 H_2O). The solution is allowed to stand for several hours, when the gold will be precipitated as metallic gold. Precipitate is filtered, washed and transferred to a 250 cc beaker.

Dissolve precipitate in aqua regia, evaporate to dryness, dilute to 150 cc and add enough 10% solution KI until the gold precipitated as aurous iodide is completely dissolved. Starch solution is then added, and the amount of N/100 $Na_2S_2O_3$ required to decolorize the liquid noted. From this amount is deducted the amount of N/100 iodine required to just produce a perceptible rose tint in the liquid.

Calculations

Number of cc $Na_2S_2O_3$ used minus the number of cc iodine used x factor x 12.2=oz. of gold (Troy) per gallon oz. of gold x 20=pwt. gold per gallon.

BRANCH NEWS

Cleveland Branch

The Cleveland Branch of the A. E. S. met at the Hotel Winton for their regular business meeting March 6, 1926. The meeting was called to order at 8 P. M., with Vice-President MacCormack presiding. After all business was taken care of a general discussion was held on the Nickel Solution. The attendance was large. Adjournment was called for at 10 P. M.

Toronto Branch

Our February meeting was exceptionally well attended and the program was both interesting and instructive. Unusual pep seemed to characterize every feature, and all except John Young remained to see the last act, which finished at 11:30 P. M.

A committee was appointed to select a topic for the paper we hope to present at Newark, and the members will co-operate to make the paper a humdinger. Toronto Branch voted to lay aside one hundred and fifty dollars, which will be contributed to the Research Committee in three yearly installments of fifty dollars each to assist the research work at the U. S. Bureau of Standards. Toronto Branch members are progressive and appreciate the efforts being made to solve the many problems confronting electroplaters.

Mr. B. A. Stone of Newark Branch was a welcome visitor. Mr. David Ayers of Prescott, Ontario, presented a very fine paper on Brass Plating. A discussion on brass plating followed and brought out many different opinions. The query, "What are the advantages of metal cyanides over carbonates?" created some interest, and each chemical received more or less support.

Cadmium versus Zinc for protective coatings did not cause much discussion. Evidently zinc will continue to do business as usual until the cost of cadmium bath tumbles at least a few points. The protective properties of cadmium were admitted, however.

One of our members described a deposit which he inspected recently: a safety razor, white, clear, non-tarnishable, plated in an amber-colored solution, voltage about 1., said to be a nickel deposit. Owner wanted to sell the dope for $4,000. After samples were plated the solution went down the sewer. Now the boys **vunder vot it vos.**

Question—When load is light, work burns. How can I stop it?

Answer—Use breakers.

Question—What will give a gold finish on polished brass?

Answer—Gold lacquer. Acetate of lead too freakish. Mr. David Ayers suggested sulphuric acid treatment, followed by frictionally treatment as remedy for troubles with spot-welded steel. It does the trick.

Bridgeport Branch

The March meeting of this branch was held on the 5th. Mr. Flaherty presiding, with a fair attendance.

President Flaherty spoke on members not keeping their dues paid, stating that he was sure that it was just carelessness, and urging those who were behind to pay up. John Slattery, Jr., who has just been married, blew the gang to a box of cigars.

The Banquet Committee, composed of R. J. O'Connor, Chairman; W. Stratten, W. Thompson, F. Spaine, N. Bernard, G. Karl and J. Oberander, reported that Hotel Stratfield had been secured for April 24, and that everything was in readiness for the big occasion. The afternoon educational session, however, is still incomplete, owing to the necessary time in writing to and receiving answers from the speakers.

Detroit Branch

Regular meeting of the Detroit Branch held at the Detroit Testing Labratories, 554 Bagley avenue, corner Second avenue, with a very poor attendance. All the officers were absent with the exception of the Secretary. No business was transacted. "Great-L-Lovering" acted as chairman. The evening was spent discussing everyday problems, one member reporting that he reduced his cadmium content in a bright nickel bath by the addition of Permaganate of Potash. One out-of-town member assisted in the discussions.

Philadelphia Branch

March meeting of Philadelphia Branch was held March 5, in the Harrison Building, U. of P., and was called to order by the President, George Gehling. Owing to the cold weather and so much sickness prevailing the attendance was not as large as usual.

Mr. A. Hirsch, chairman of the Educational Committee, reported having visited the Northeast Manual Training School and will visit the Rensington High School the coming week. Mr. Hirsch made an encouraging report on the bright prospects and the great interest shown by the principles of the vocational classes at the Northeast School. There are about 1,000 plumbers and apprentices taking courses in this craft, and the committee hopes that the members of the Philadelphia Branch will grasp this fine opportunity offered by the vocational courses.

All the absentees are urged to come to the April meeting just to see what is being done, and there is sure to be a discussion on some subject that will make it worth while.

Boston Branch

Boston Branch met Friday, the 5th, with President Talamona in the chair. After the regular order of business we had another talk by William Simonetti on the gold plating of jewelery, and how he finishes the colors. A vote of thanks was given him for his very interesting talks. Mr. Harry Wright also spoke on acid copper plating. A short discussion took place, with adjournment at 10:30 P. M.

Chicago Branch

Regular monthly meeting Chicago Branch, held March 13, 1926, at the Atlantic Hotel. Meeting called to order with Vice-President Jacob Hay presiding, and a very good attendance.

Dr. Cooper of the American Chemical Society was visiting with us and gave a talk on the work being carried on by his society; also invited members of the A. E. S. to attend their Convention, which is to be held at the Chicago Beach Hotel. Vice-President Hay thanked Dr. Cooper for his invitation, and was given a good hand by the members present.

Mr. O. E. Servis was again appointed to the task of gathering material for the coming Newark Convention. Several promises have been made for papers and exhibits. Vice-President proceeded to appoint a Railroad and Publicity Committee, consisting of Mr. E. Lamoureux, Chairman; F. J. Hanlon, R. J. Hazuch, R. Meyers.

Chicago Branch looks forward to a good turnout this year. Subject for the evening was "Pickling High Carbon Steel," but owing to the late hour same was layed over for our next meeting.

Question Box—Chicago Branch

Q. 1. What is the best brightener for a Cadmium Solution?
A. 1. White wool yarn, dissolved in caustic soda.

Q. 2. What is a good Oxidize to get a Brown Bronze on steel copper-plated, without getting black streaks and minimum scratch brushing?
A. 2. Barium Sulphide and Ammonium Sulphate.

Q. 3. What is the Chemical formula for Sodium Perborate?
A. 3. NA—BO_3.

Q. 4. Is there any way to plate Bright Galvanize on unpolished iron well tumbled and burnished, that will hold its color for a reasonable length of time?
A. 4. Work should be Nickel plated, then plate with Zinc, using Grape Sugar for brightener.

Q. 5. What do we know about Steelite—can it be deposited in any form or way?
A. 5. This metal being an alloy of Cobolt Chromium and Tungsten it was thought that same cannot be successfully deposited.

Q. 6. What is the Fiske finish on Brass?
A. 6. Brush Brass.

Q. 7. Wanted, a cheap grap black on zinc?
A. 7. Black nickel solution was suggested.

Q. 8. Will Iron deposits of pure Iron, Rust?
A. 8. It was thought that deposits of Iron are not pure enough to withstand corrosion.

New York Branch

The February meetings of the New York Branch, A. E. S., were well conducted and both meetings had a large attendance.

Report of Chairman of Banquet Committee, Mr. Franklyn McStocker, was feature of the first meeting, report showing that banquet was one grand success.

The second meeting, featuring Mr. Joseph Downs, who gave an eloquent address on "Modern Silver Plating," describing in detail all up-to-date methods employed by Factory (E) of the International Silver Company of Meridan, Conn. Mr. Joseph Downs was given a rising vote of thanks by the branch.

ELECTED TO MEMBERSHIP

St. Louis Branch

Floyd Thompson, Active .....Box 123, So. Pittsburg, Tenn.

Detroit Branch

August A. Spies, Active .....Marysville, Mich.

Bridgeport Branch

Frank F. Jack, Active .....c|o The A. C. Gilbert Co., New Haven, Conn.
George A. Wagstaff, Active .....25 Oliver St., Stamford, Conn.

Milwaukee Branch

E. F. Dingley .....5305 Lucksley Ave., Oakland, Calif.
Chas. H. Stoddard, Associate .....2010 Arthur Ave., Chicago, Ill.
Emil C. Fritschi, Active .....852 Buffum St., Milwaukee, Wis.

New York Branch

Edward J. Boyer, Active .....221 West Cartland St., Grafton, N. Y.
Chas. C. Kramer, Active .....1270 Decaturs St., Brooklyn, N. Y.
Jacob Reingold, Active .....549 Bushwick Ave., Brooklyn, N. Y.
John Morris, Active .....790 Madison St., Brooklyn, N. Y.
A. Knechtel, Active .....1255 Jefferson Ave., Brooklyn, N. Y.
Axel Terko, Active .....37 W. 90th St., New York, N. Y.
E. J. Boyer, Active .....221 West Cortland St., Groton, N. Y.
C. C. Kramer, Active .....1270 Decatur Ave., Brooklyn, N. Y.
J. C. Reingold, Active .....549 Bushwick Ave., Brooklyn, N. Y.
John Morris, Active.....790 Madison St., Brooklyn, N. Y.

Philadelphia Branch

Wm. R. Schofield, Associate .....5843 N. Lawrence St., Philadelphia

Newark Branch

Joseph A. Comforte, Active .....169 Thomas St., Newark, N. J.
Albert H. Schnering, Active .....749 So. 18th St., Newark, N. J.

Chicago Branch

David Swanson, Active .....905 Fletcher St., Chicago, Ill.
Chester McDowell, Active..c|o Chicago Telephone Supp. Co., Elkhart, Ind.
Roy Wilson Kelley, Active .....3319 Chicago Ave., Chicago, Ill.
Joseph Signa .....526 Grant Place, Chicago, Ill.

REJECTED

New York Branch

T. H. Johnson .....23 West 24th St., N. Y. C.

APPLICATIONS FOR MEMBERSHIP

Milwaukee Branch

Charles H. Stoddard .....2010 Arthur Ave., Chicago, Ill.
Emil C. Fritschi .....852 Buffum St., Milwaukee, Wis.

Newark Branch

Henry J. Graff, Active .....611 Magie Ave., El Mora, Elizabeth, N. J.
Nelson F. Sievering, Active .....24 Stanford Place, Montclair, N. J.

Toronto Branch

John Lockridge, Active .....Wingham, Ontario

Cincinnati Branch

Aloysius Yaegers .....2020 Sherman Ave., Norwood, Ohio

New York Branch

Edward Olsen .....425 East 65th St., N. Y. C.
Axel Terho .....37 West 90th St., N. Y. C.
Anthony Knechtel .....1255 Jefferson Ave., Brooklyn, N. Y.
R. E. Pettit .....14 Fountain Ave., Matawan, N. J.
F. B. Sullivan .....106 W. North St., Ilion, N. Y.
C. R. Pritchard .....531 18th Ave., Newark, N. J.
J. Parule .....642 President St., Brooklyn, N. Y.
J. Dara .....64 Ellery St., Brooklyn, N. Y.
C. F. Beck .....Yale & Towne Mfg. Co., Stamford, Conn.
J. Pearsall .....152 Furman St., Schenectady, N. Y.
R. F. Steinmetz .....917 Hill St., North Bergen, N. J.
L. Deitrich .....1999 Metropolitan Ave., Middle Village, L. I.
G. H. Hunter .....441 Marion St., Brooklyn, N. Y.

A Cordial Invitation is Extended to You and Your Friends to Attend the

EIGHTH ANNUAL BANQUET

Of the Bridgeport Branch of the American Electroplaters Society at Hotel Stratfield, Bridgeport, Conn.

SATURDAY, APRIL 24, 1926

Afternoon Session 3:00 P. M. Papers and addresses by prominent members of the trade. Banquet at 7:00 P. M. Do not miss the movie of

"COPPER FROM MINE TO CONSUMER"

with an address from Mr. Skowronski on Copper Research. Dancing and songs after the banquet. Do not forget to bring the ladies.

All those desiring further information and tickets address R. J. O'Connor, Chairman, 1228 Noble Avenue, Bridgeport, Conn.